Meteorological Characterization

Methods Evaluation

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Task 1.3
Adequacy and validity of the surface and upper-air meteorological measurement variables

1. Review and summary of methods
2. Mechanical vs. sonic wind measurements
3. Spatial representativeness of low wind measurements
4. Validity of two-component sodar
5. Adequacy of the RASS vertical coverage
6. RASS range gate impact on observations
7. Usefulness of aircraft temperature soundings
8. Temporal adequacy of surface measurements

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1. *Review and summary of methods*

Method

- Begin with STI's existing inventory
- Summarize additional sources of data

Results

- Work in progress
- Summary dependent on results from other subtasks

2. *Mechanical vs. sonic wind measurements*

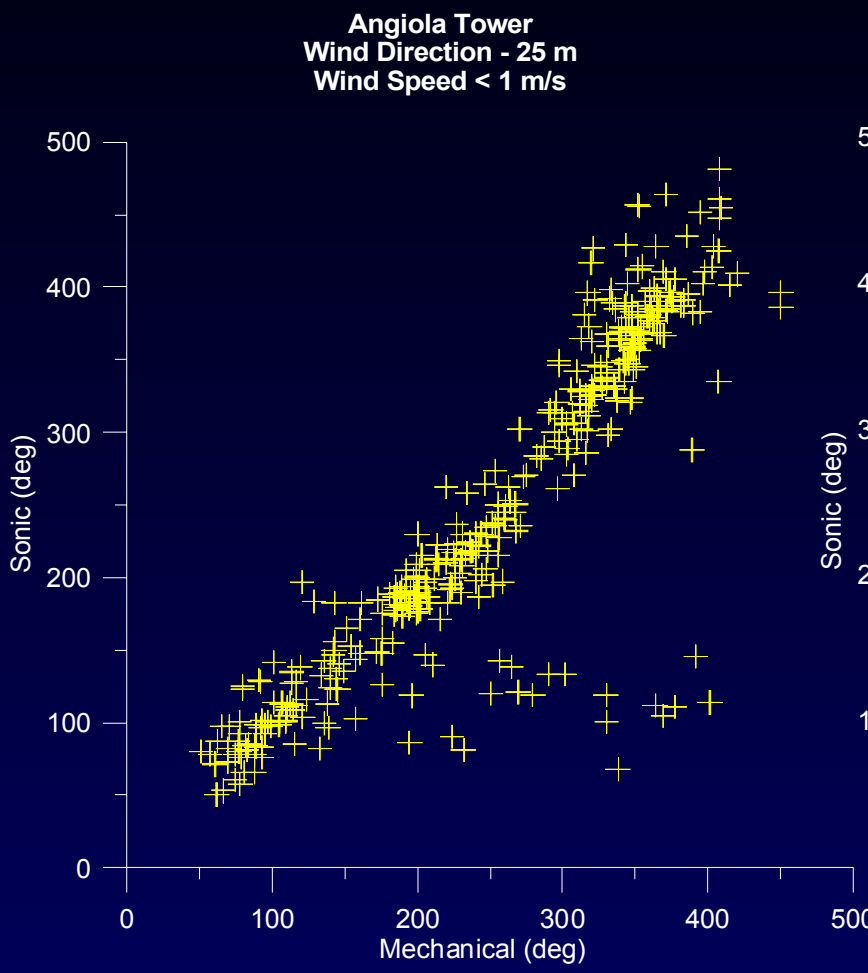
Method

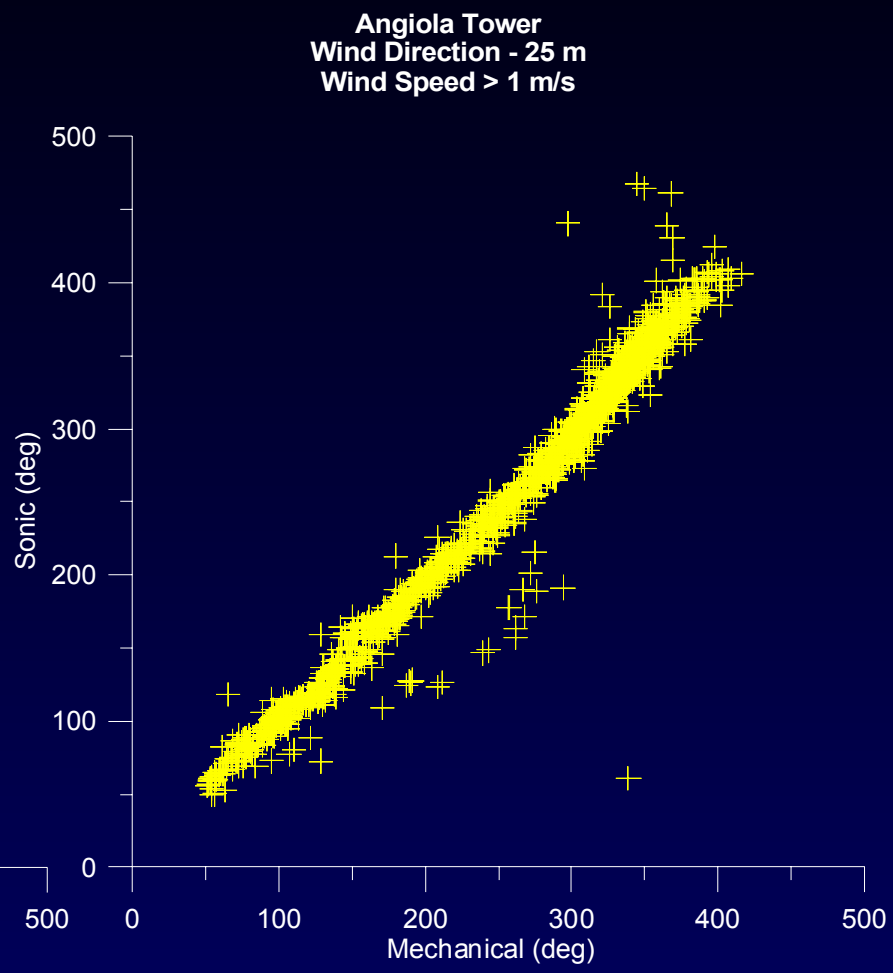
- ⇨ Obtained subset of sonic data
- ⇨ Processed into 5-minute intervals

Results

- ⇨ Little difference between data sets for wind speed and wind direction
- ⇨ No significant biases, even under low wind speeds

2. Mechanical vs. sonic wind measurements





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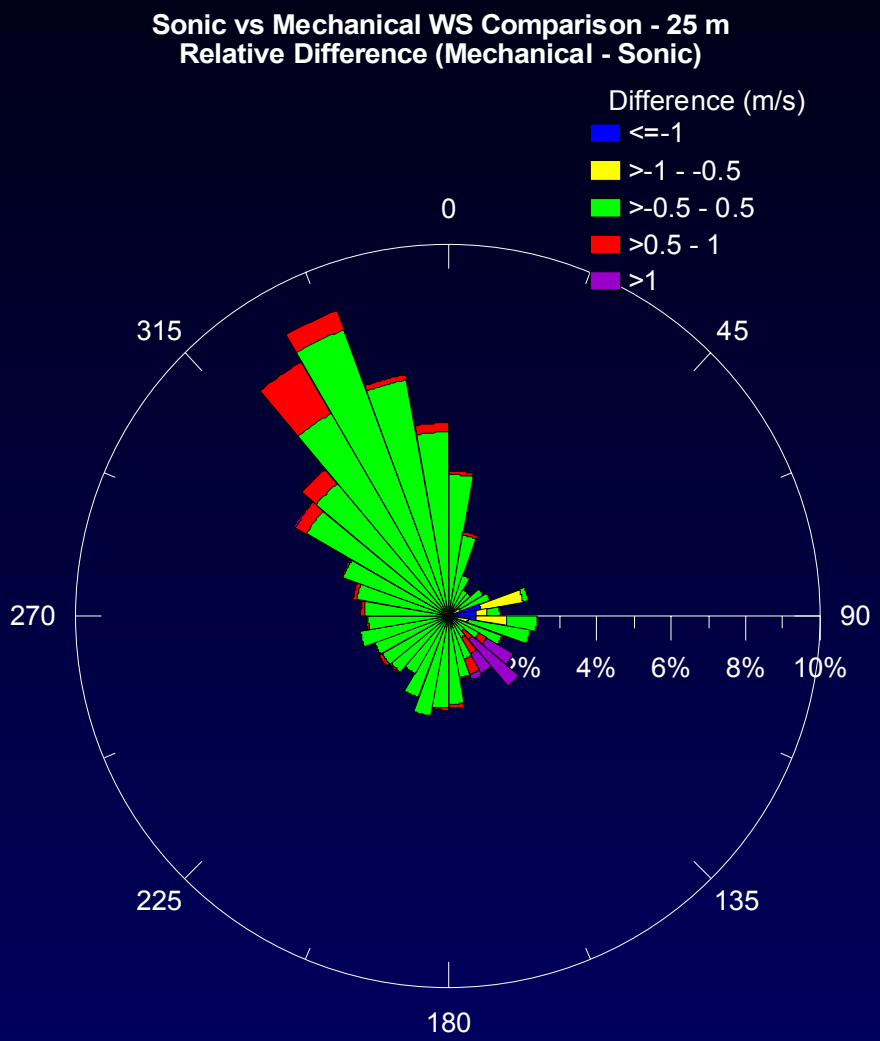
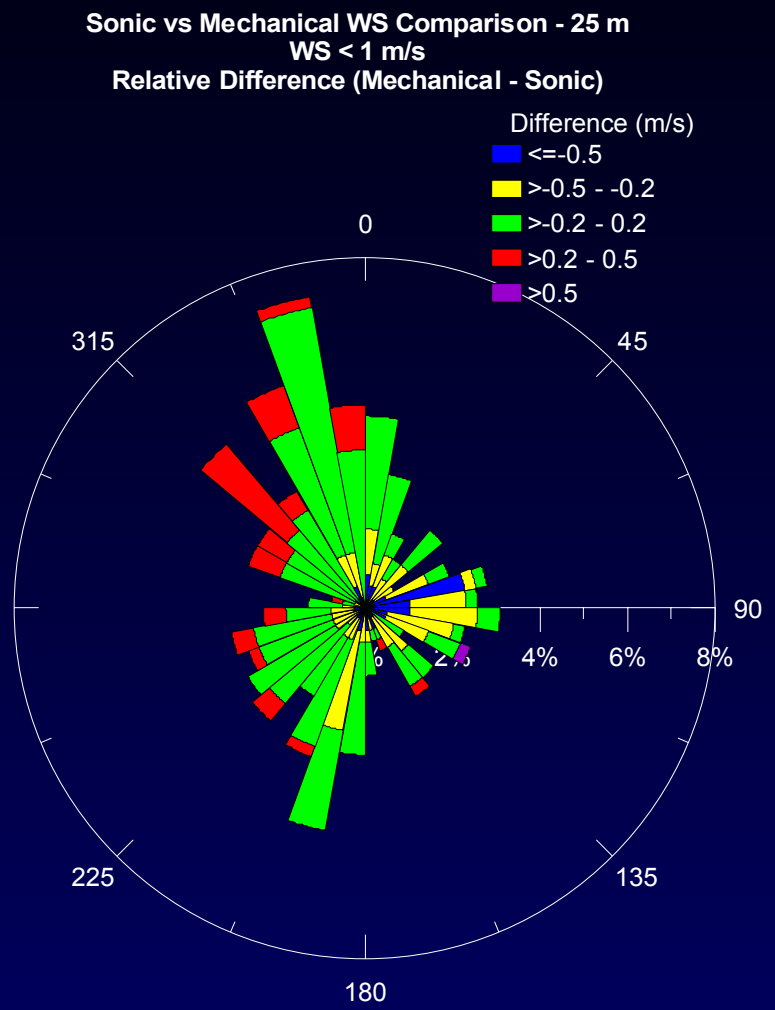
2. Mechanical vs. sonic wind measurements





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3. *Spatial representativeness of low wind measurements*

Method

⇨ Missing 20-meter tower data

Results

⇨ Analysis not performed

4. *Validity of two-component sodar*

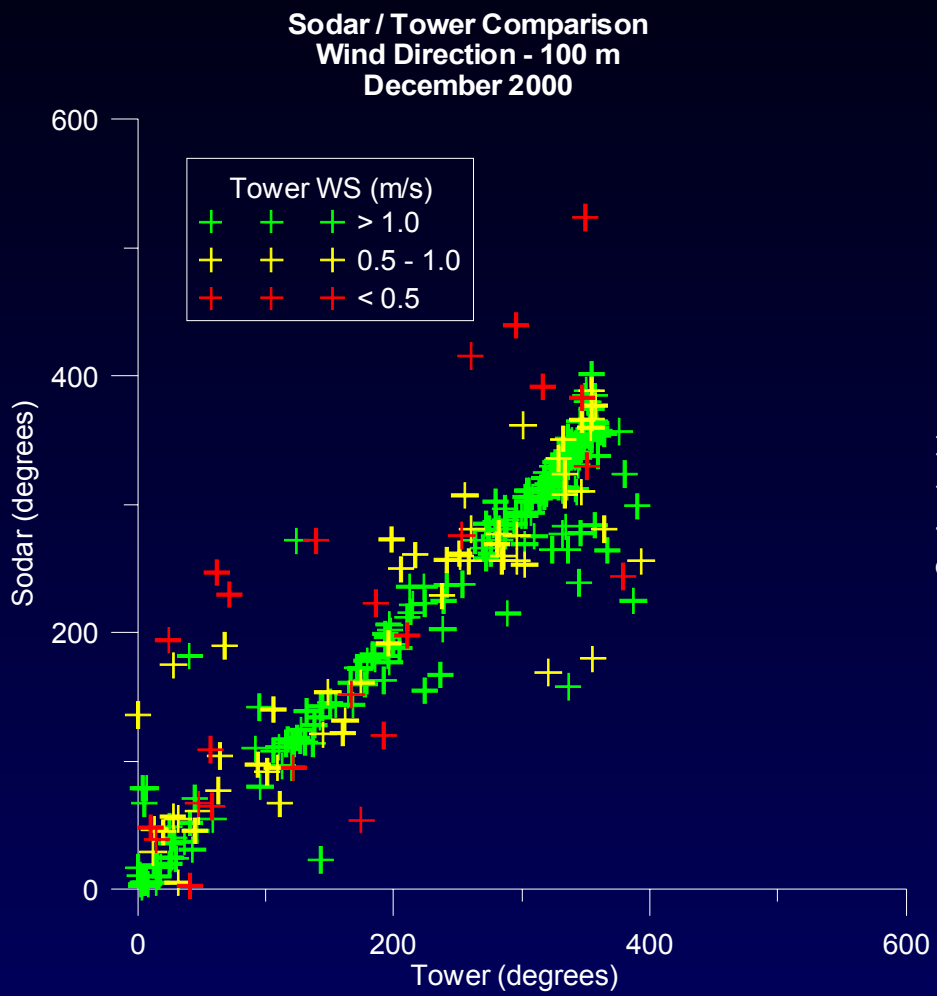
Method

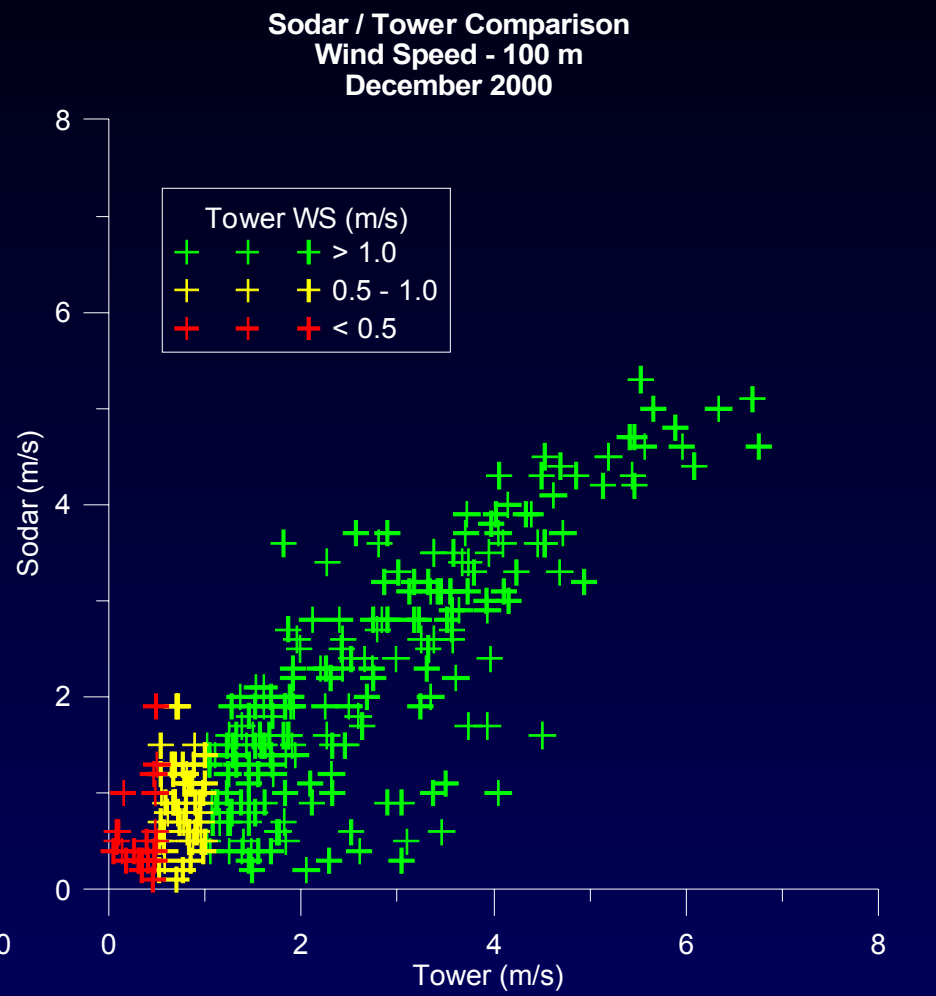
- Sodar winds compared with 100-meter tower data
- Only 98-m level available for comparison

Results

- Significant differences, especially for wind speed
- Sodar data for trajectory analysis may be limited

4. *Validity of two-component sodar*





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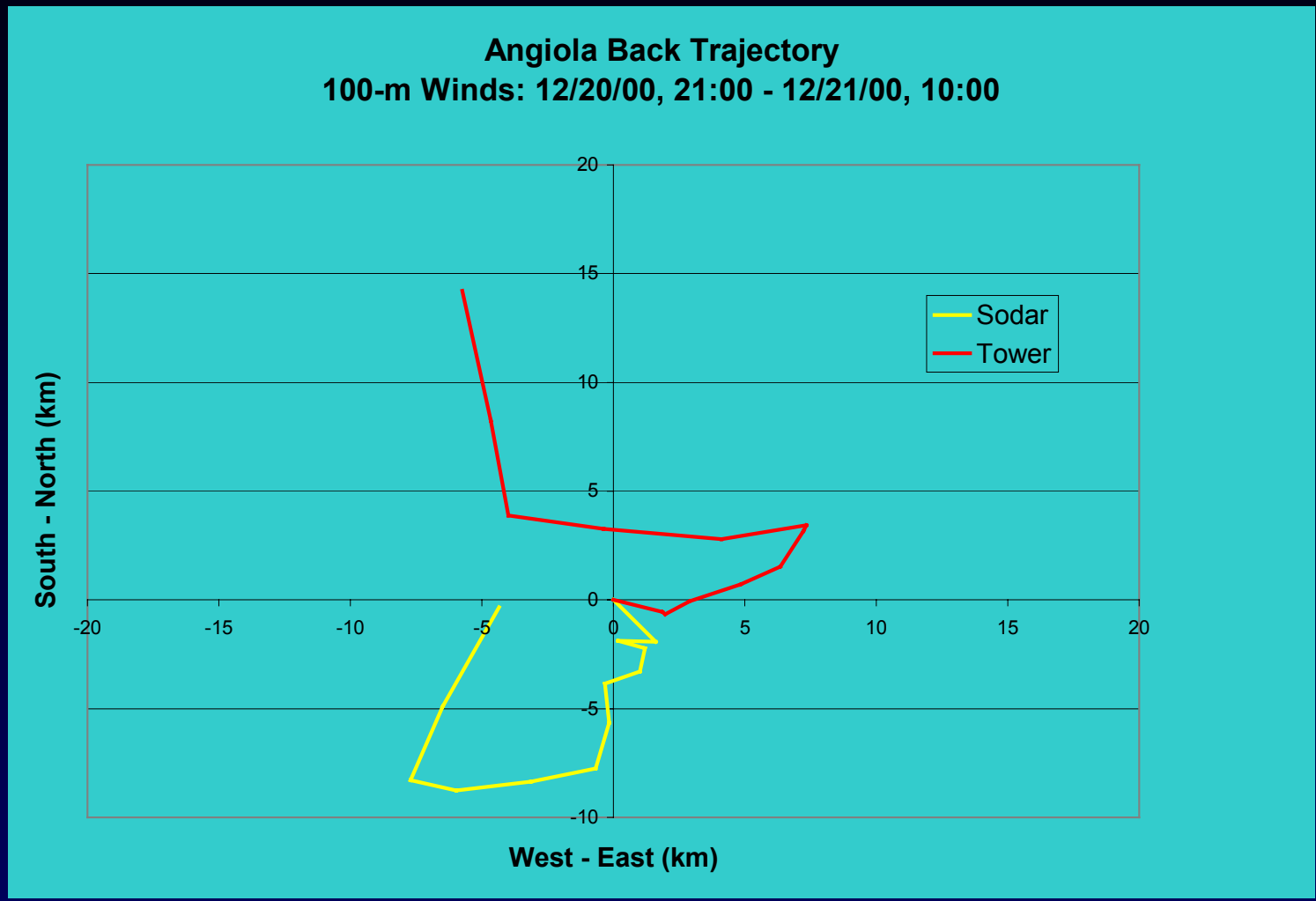
4. *Validity of two-component sodar*

Mechanical WS (m/s)	Correlation (r)		Average WS (m/s)		N
	WS	WD	Mechanical	Sodar	
0 – 0.5	0.263	0.775	0.30	0.57	24
0.5 – 1	0.018	0.886	0.77	0.86	56
0 – 1	0.303	0.828	0.61	0.77	80
> 1	0.823	0.960	2.71	2.24	215

4. *Validity of two-component sodar*



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5. *Adequacy of the RASS vertical coverage*

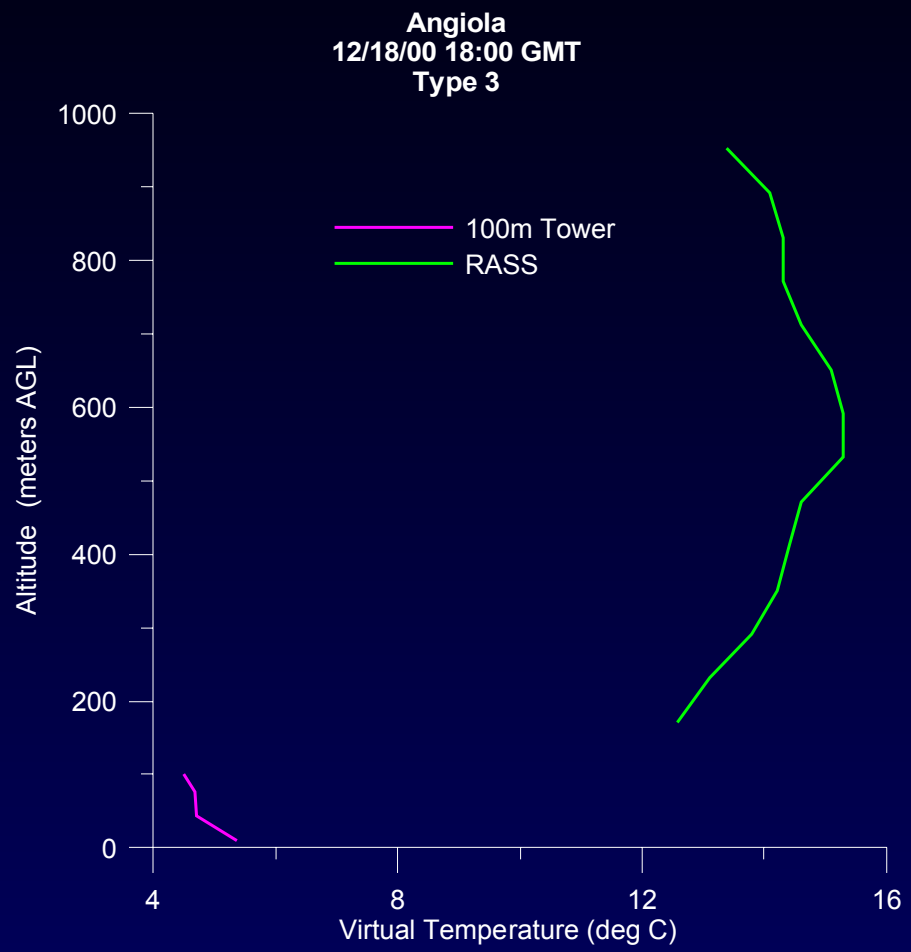
Method

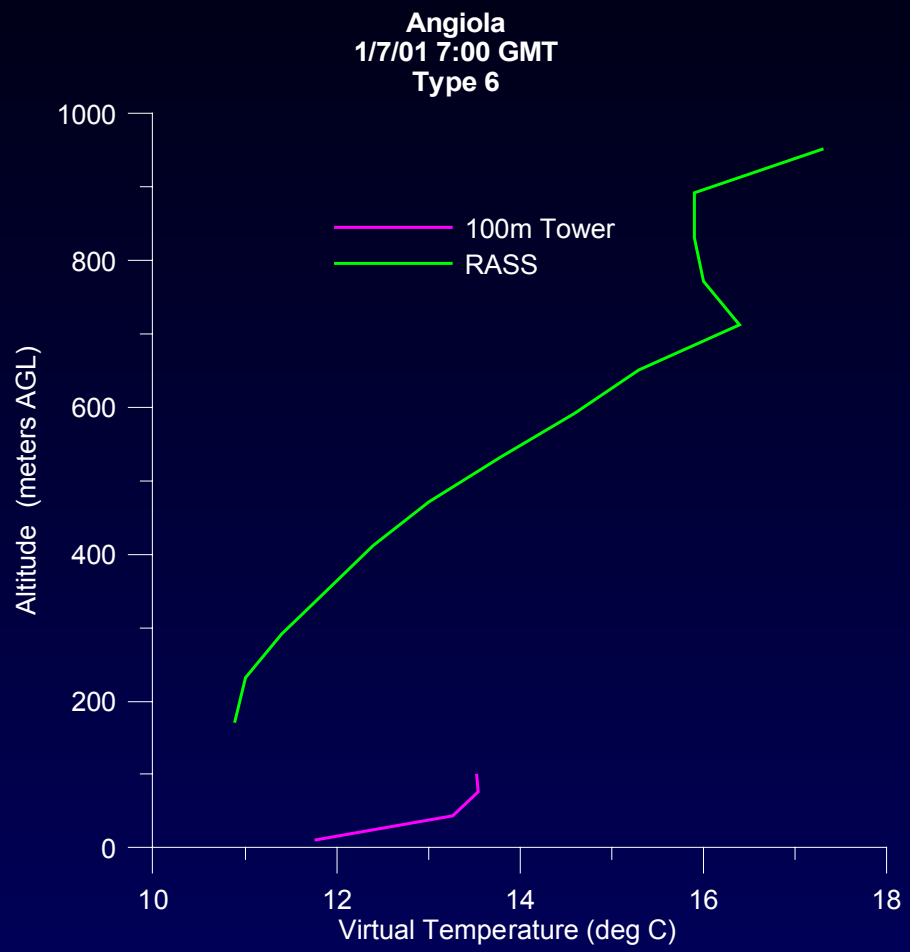
- RASS and 100-m tower data merged for three IOPs
- Soundings categorized into 10 types based on ability to identify top of mixing layer

Results

- Approximately 1/3 of soundings problematic for identifying top of mixing layer
- Inaccuracies in RASS may compound problems

5. *Adequacy of the RASS vertical coverage*





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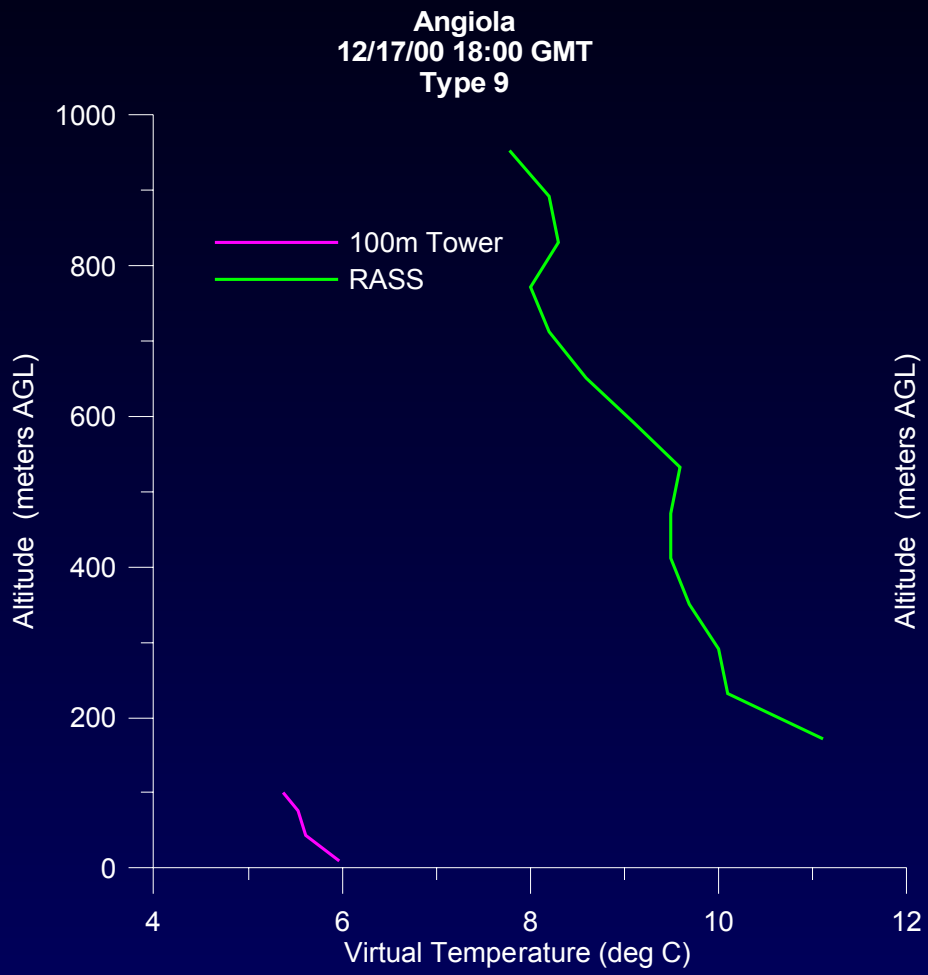

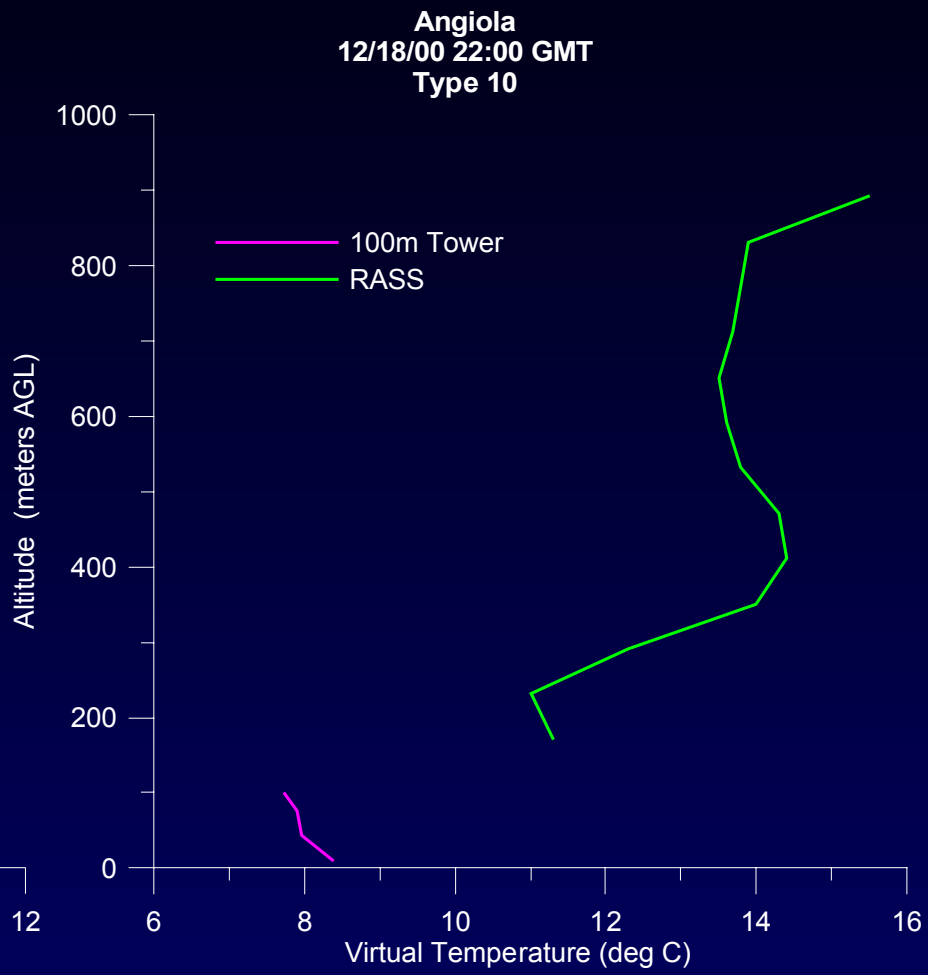

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6. RASS range gate impact on observations

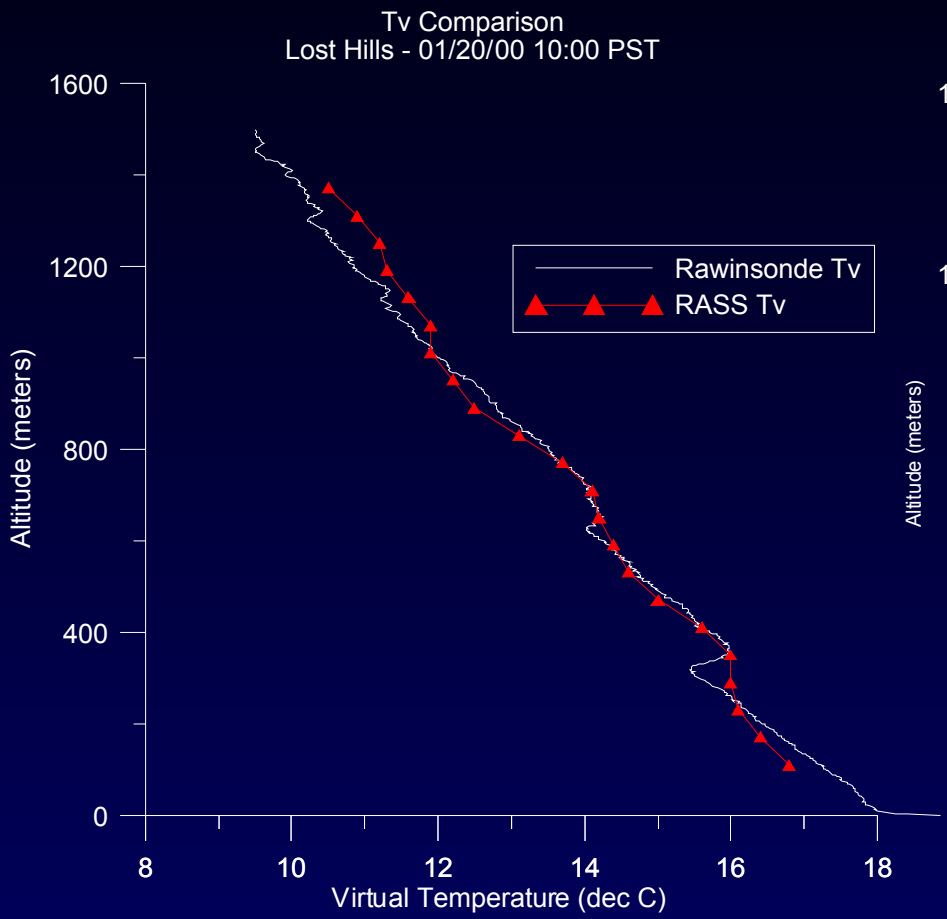
Method

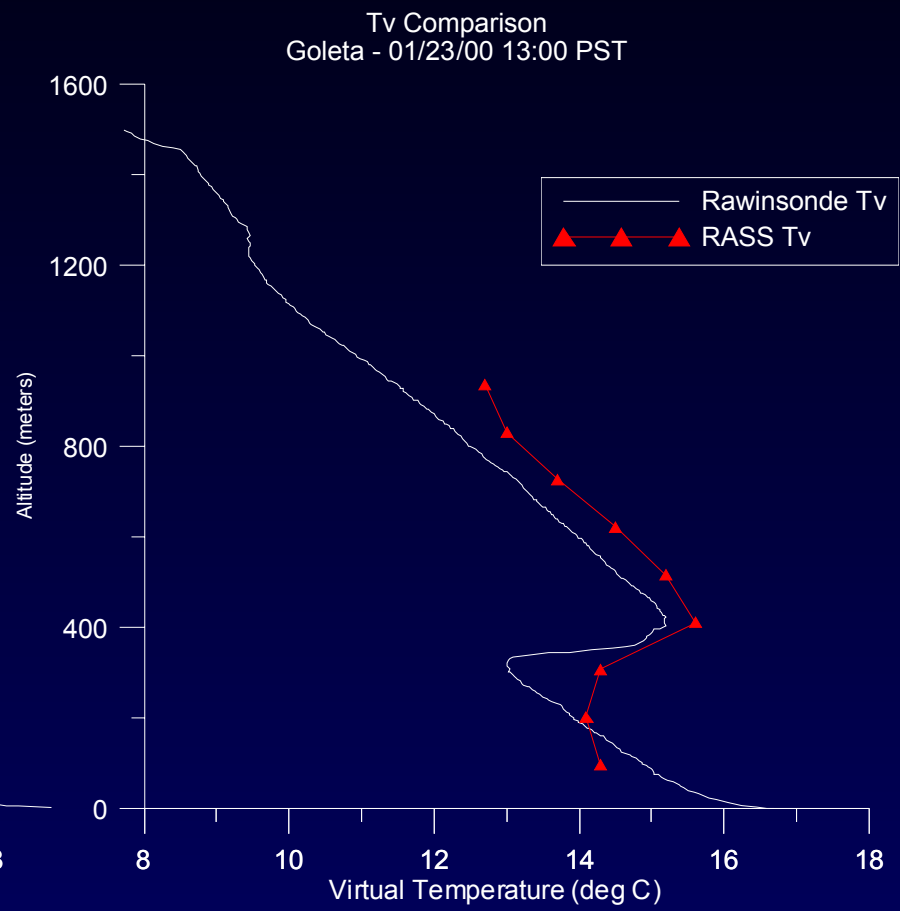
- Compared RASS data with 39 rawinsonde soundings from audits at 11 sites
- Calculated and compared inversion strength (lapse rate) for both methods

Results

- Approximately 1/4 of the inversions were not identified by RASS
- RASS underestimated inversion strength by 67%

6. RASS range gate impact on observations





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6. RASS range gate impact on observations

Sites	Inversions (N)	Average Inversion Strength Audit (°C/100 m)	Average Inversion Strength RASS (°C/100 m)	Average Percent Difference
All	35	1.37	0.41	-67%
Sites with 60 m gate	15	1.44	0.51	-54%
Sites with 105m gate	20	1.31	0.33	-76%

8. Temporal adequacy of surface measurements

Method

- Used 5-min and 1-hr average wind data
- Calculated and compared 1-hr wind run using both sets for December 2000

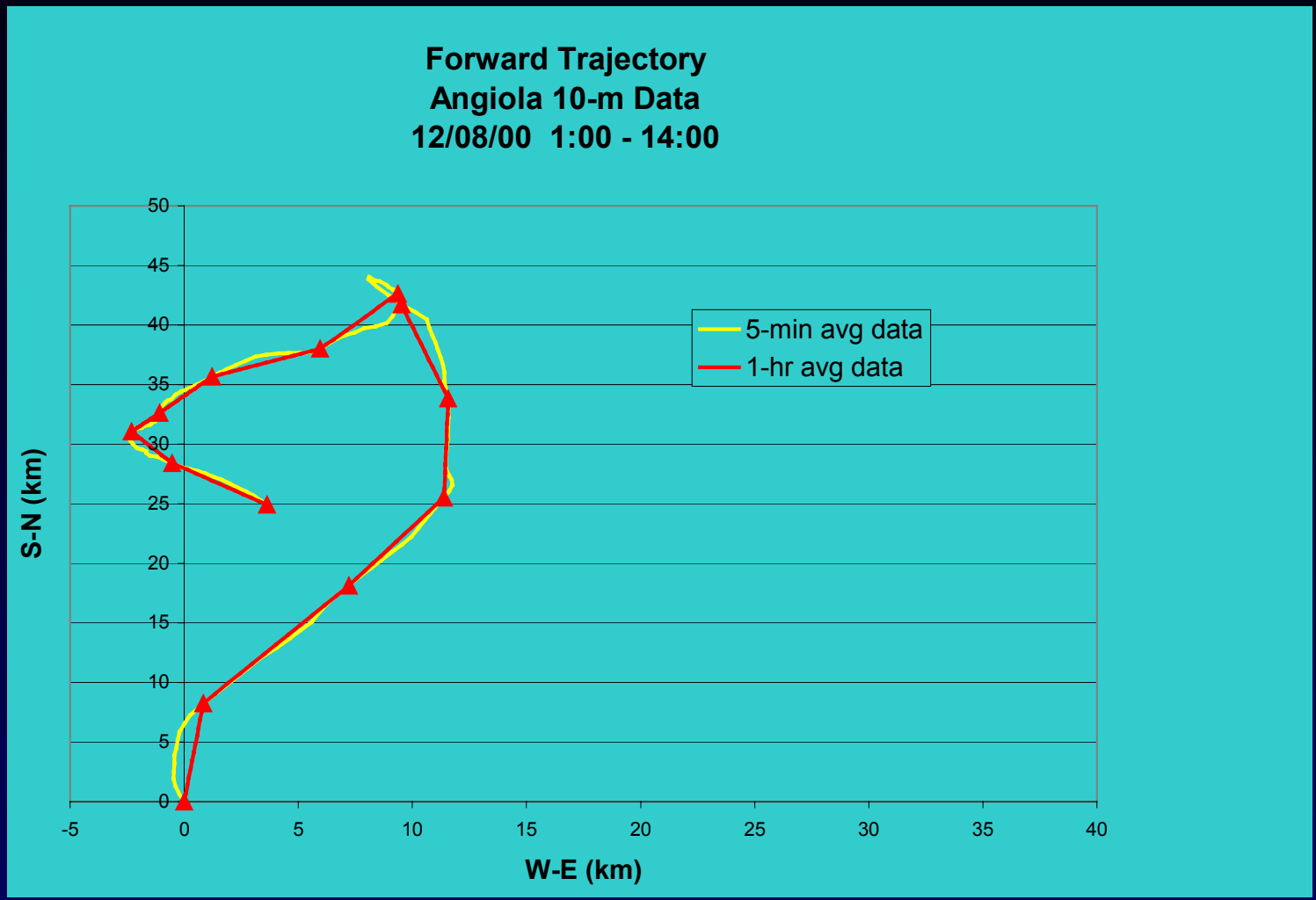
Results

- Differences between two data sets do not appear significant

8. Temporal adequacy of surface measurements

Scalar WS range (m/s)	N	Average Scalar WS (m/s)	Average Vector WS (m/s)	Average hourly wind run – 5 min averages (km)	Average hourly wind run – 1 hr averages (km)	Diff. (km)
0 – 1	121	0.75	0.58	2.59	2.09	0.50
1 – 1.5	141	1.25	1.07	4.40	3.87	0.53
1.5 – 2	160	1.75	1.61	6.21	5.79	0.42
2 – 2.5	95	2.22	2.01	7.91	7.43	0.48
2.5 – 3	60	2.74	2.65	9.80	9.54	0.26
> 3	76	3.74	3.65	13.37	13.14	0.23
All	653	1.85	1.70	6.56	6.13	0.43

8. Temporal adequacy of surface measurements



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7. Usefulness of aircraft temperature soundings

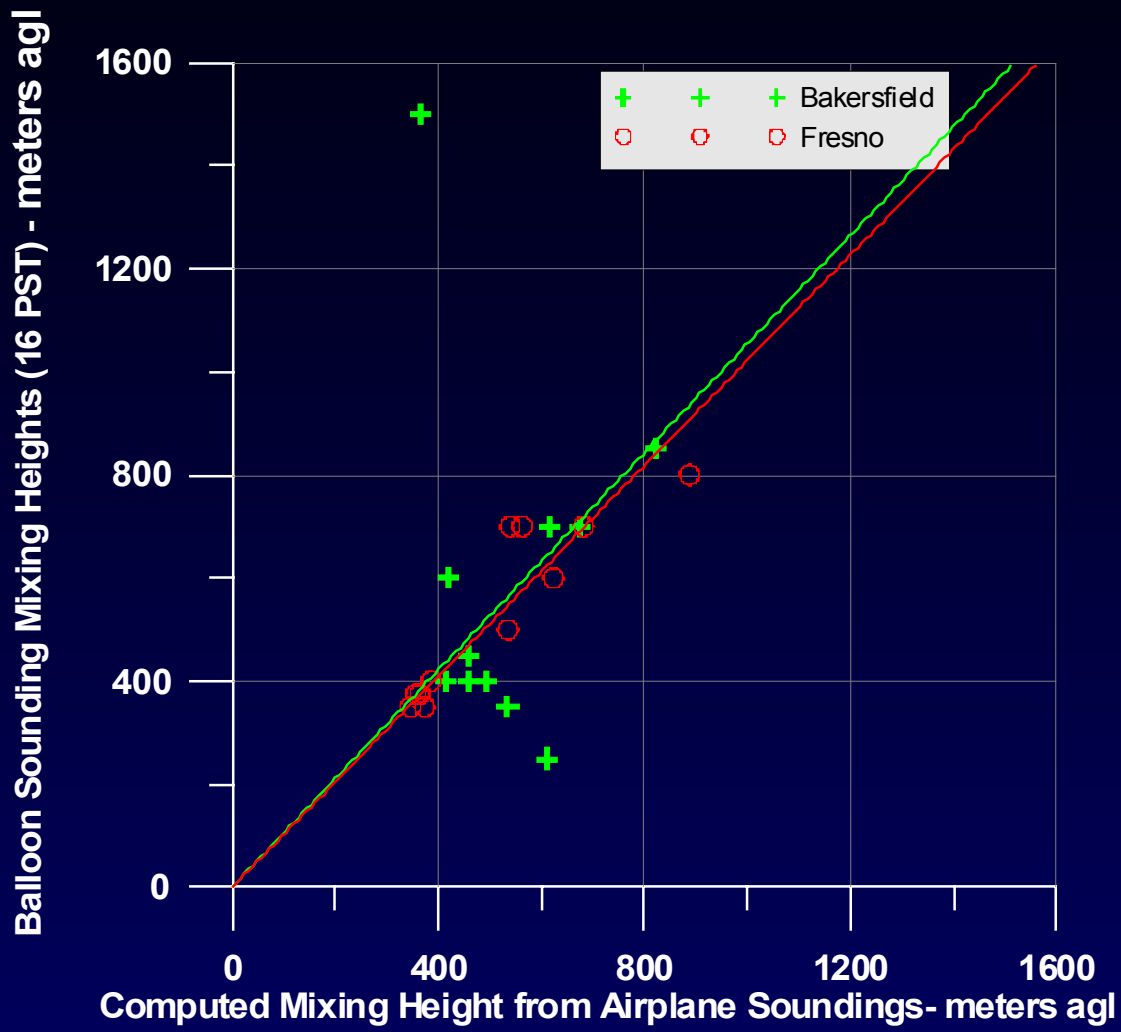
Method

- Compared aircraft soundings with rawinsonde data at Fresno and Bakersfield
- Used Holzworth method for determining mixing heights

Results

- Comparison results remarkably good at Fresno
- Less agreement at Bakersfield, possibly due to systematic differences between contractors

7. Usefulness of aircraft temperature soundings



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